

**Interagency Fish Passage Steering
Committee**

2013 Annual Report

**Focusing on the Shasta Dam Fish
Passage Evaluation**

Contents

Background 2

Steering Committee 2

 Steering Committee Activities 3

 Focus Areas 4

 Pilot Implementation Plan 4

Summary of Activities by Focus Area 4

 Habitat 4

 Fish Passage Technology 8

 Outreach 9

 Policy and Regulation 10

 Fish Health and Genetics 11

 Pilot Plan 11

Interagency Fish Passage Steering Committee - 2013 Annual Report - Focusing on the Shasta Dam Fish Passage Evaluation

Background

The Shasta Dam Fish Passage Evaluation (SDFPE) is an effort to evaluate the feasibility of reintroducing Chinook salmon and steelhead to tributaries above Shasta Lake. A Fish Passage Pilot Implementation Plan is being developed with representatives from U.S. Bureau of Reclamation (Reclamation), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), California Department of Water Resources (DWR), California Department of Fish and Wildlife (DFW), California State Water Board, and the University of California Davis.

The SDFPE is part of Reclamation's response to the June 4, 2009, Biological Opinion (BO) on the Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) by NMFS. The NMFS BO concluded that, as proposed, CVP and SWP operations were likely to jeopardize the continued existence of four federally-listed anadromous fish species: Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, and the Southern distinct population segment of the North American green sturgeon. The BO set forth a Reasonable and Prudent Alternative (RPA) that allows continued operation of the CVP and SWP in compliance with the federal Endangered Species Act (ESA).

The NMFS RPA includes a Fish Passage Program (Action V) to reintroduce winter-run and spring-run Chinook salmon and steelhead. Action V of the RPA applies to three dams operated by Reclamation: Shasta, Folsom, and New Melones. The near-term goal for Action V, as stated in the RPA, is to increase the geographic distribution and abundance of the listed fish. The long-term goal is to increase abundance, productivity, and spatial distribution, and to improve the life history, health, and genetic diversity of the target species. Initial activities by the steering committee worked towards conducting simultaneous evaluations of fish passage around Shasta and Folsom dams. Due to the interagency resource coordination needs, complexity of the project, and similar technological aspects of the evaluations between watersheds, the agencies are now focusing the initial evaluations on Shasta. Lessons learned from evaluations at Shasta will be applied to evaluating passage at Folsom and New Melones.

Steering Committee

The Interagency Fish Passage Steering Committee was formed in 2010 to focus on all three fish passage evaluation watersheds. That Steering Committee has evolved into the Shasta Fish Passage Steering Committee (SFPSC) to reflect the focus on evaluating fish passage at Shasta. The following table lists SFPSC membership.

Shasta Fish Passage Steering Committee Members

Agency	Members
US Bureau of Reclamation	John Hannon, David van Rijn
National Marine Fisheries Service	Jeff McLain, Alice Berg
US Fish and Wildlife Service	Jim Smith, Donnie Ratcliff
CA Department of Fish and Wildlife	Tom Schroyer, Mike Berry
CA Department of Water Resources	Randy Beckwith, Ted Frink, Marc Commandatore
US Forest Service	Bill Brock, Michael Kellett
Academic member	Lisa Thompson
Water Board	Amber Villalobos

SFPSC Activities

Reclamation received funding in 2012 for dedicated work on the project. The SFPSC developed a statement of objectives for completing habitat assessment, conducting outreach, developing the fish passage pilot plan, completing National Environmental Policy Act (NEPA) documentation and any needed permit applications for pilot plan implementation. In spring 2013, an 18-month contract was awarded to MWH to conduct tasks to meet the objectives. MWH staff met with SFPSC and related subcommittees in July to describe their proposed approach and receive feedback from committee members. MWH will work closely with SFPSC throughout the contract period to meet the objectives of the contract.

SFPSC members from DWR, NMFS, and Reclamation visited fish passage projects at high head dams at six locations in Washington and Oregon to get a first-hand view of fish passage systems being used in the following areas:

- Deschutes River – Pelton-Round Butte Project, Oregon
- Baker River – Baker River Project, Washington
- Cowlitz River – Cowlitz River Project, Washington
- Clackamas River – Clackamas River Project, Oregon
- McKenzie River, South Fork – Cougar Dam, Oregon
- McKenzie River – Carmen-Smith Project, Oregon

Each project listed above is unique. Lessons learned from these projects can be applied to projects in California. Shasta is unique in that the lake has a very high shoreline development, temperature stratification is deep, and winter-run Chinook spawn in the summer with fry present starting in August. The SFPSC and MWH staff hasn't found any examples of head-of-reservoir juvenile collectors and expects that collection at the head of Shasta Reservoir or in the tributaries may be necessary. The DWR, NMFS, and Reclamation staff (Beckwith, Berg, and Hannon) developed a presentation on the Pacific Northwest projects for the SFPSC and gave similar presentations to other interested groups. NMFS is developing a video highlighting these projects, which will be used as an outreach tool when talking about aspects of fish passage in California.

Focus Areas

To guide the SFPSC effort, the participating agencies have identified six focus areas. Additional staff from the SFPSC agencies participate in subcommittees developed to address technical items related to each of these focus areas:

- **Habitat:** Conduct habitat-related work including surveys, data collection, habitat maps, Habitat Assessment report, and related habitat issues and decisions.
- **Fish Passage Technology:** Develop and assess fish passage technology and passage efficacy, design, reservoir hydrodynamics, screen criteria, operations.
- **Fish Health and Genetics:** Assess the health of existing fish populations above Shasta Lake, and identify broodstock selection, and the health and genetics of the potential broodstock.
- **Pilot Planning:** Compile information from the Habitat, Fish Passage Technology, Fish Health and Genetics, and Policy and Regulation focus areas, as well as identifying other management activities and monitoring programs to successfully implement a pilot implementation program for fish reintroduction.
- **Policy and Regulations:** Define and comply with NEPA, National Historic Preservation Act, Wild and Scenic, and ESA permits and regulations as they relate to reintroduced salmon.
- **Public Outreach:** Coordinate and foster broad awareness and transparency of the SFPSC among the public, agencies, landowners, organizations, elected officials, and other interested parties.

Pilot Implementation Plan

At a general level, the Pilot Implementation Plan is a near-term experimental effort to determine the feasibility of reintroducing Chinook salmon to tributaries above Shasta Lake and transporting migrating juvenile fish to the Sacramento River below Keswick Dam. The Plan will evaluate possible approaches to the capture, transport and release of fish at different life stages. Key elements of the Plan include review of existing information on the species and existing habitat conditions, additional field surveys to determine the condition of existing habitat, and identification of potential locations for the collection and release of fish. If a fish passage program is determined to be feasible, lessons learned during the experimental studies will be applied to a long-term fish passage program at Shasta.

Summary of Activities by Focus Area

Activities conducted as part of the initial planning the evaluation are summarized below by focus area.

Habitat

The Habitat Subcommittee consists of representatives from the SFPSC agencies. The purpose of the Habitat Subcommittee is to conduct habitat-related work including surveys, data collection, habitat mapping, a Habitat Assessment report, and addressing related habitat issues and decisions. Existing habitat data has been collected for the McCloud and Sacramento rivers. Much current information is available from Federal Energy Regulatory Commission (FERC) relicensing studies on PG&E's McCloud-Pit project and other sources. A key information need that has not been available is water temperature data for the Sacramento River. No monitoring stations exist on the mainstem Sacramento River other than the Delta gauge near the high water line of Shasta Lake. Therefore, nine water temperature monitoring sites were established between Box Canyon Dam and the Delta gauge. Figure 1 shows newly established station locations and Figure 2 shows water temperatures at these sites including the summers of 2011 and 2012. Based on these data, the Sacramento River provides water

temperatures below 56°F (the compliance temperature NMFS uses to define optimal winter-run spawning habitat in the lower Sacramento River) in the first 10 or so miles below Box Canyon Dam. A tenth temperature logger was added in 2013 to more precisely locate the location where 56°F is provided through the summer. Water temperature data collected by The Nature Conservancy and PG&E in the McCloud River shows that a reach of sub-56°F water is provided throughout the summer below McCloud Dam. Two temperature gauges were also established in Squaw Creek in 2012 (at Fender's Ferry Road Bridge and at Madrone Campground). Initial data are showing that temperatures are probably too warm for the listed Chinook salmon over the summer in Squaw Creek, although the physical habitat looks good. A fire in the fall of 2012 affected the mainstem reaches of the McCloud River and Squaw Creek. Sediment inputs were increased during rain events on the burned areas, particularly during large rain events late in November and December 2012.

Reconnaissance trips occurred in McCloud Lake and at McCloud Falls. Potential may exist for a fish passage program to utilize the habitat in the McCloud River above McCloud Lake and in McCloud Lake. Over 600 cfs of cold spring water feeds the McCloud River between the lower falls on the McCloud and McCloud Lake. The suitability of the river habitat for spawning salmon is unknown and would need to be assessed. McCloud Lake has year-round cold water without the dissected shoreline and abundance of introduced species which add complexity to the Shasta Lake area. The habitat may be suitable in McCloud Lake for juvenile Chinook salmon to rear and add substantial growth before they are collected and transferred downstream, below Keswick Dam. McCloud Reservoir is similar to the scale of the high head reservoirs in the Pacific Northwest with juvenile collectors. Potential may exist to integrate a juvenile collector with the outlet structures in McCloud Lake.

A reconnaissance-level survey was also conducted through The Nature Conservancy Preserve on McCloud River from river mile 15.5 to 19. This reach has a lower gradient than the upstream section from McCloud Dam to Ash Camp that was surveyed in 2010. Spawning habitat is more available in this reach than in the upstream reach. Although spawning habitat patches are present, they are not extensive. Much of the spawning habitat consists of small gravel (less than one inch) between small boulders (Figure 3 top). Overhanging vegetation along much of the reach (consisting largely of *Darmera*) would likely provide suitable fry and early juvenile rearing habitat (Figure 3 bottom).

A landscape-level habitat assessment is planned to begin in fall 2013. An analytical framework for habitat assessment is being finalized by the MWH team (Figure 4). The assessment will map significant spawning and rearing habitat patches, identify migratory barriers, and roughly estimate the number of spawners that could be accommodated within river reaches containing temperatures suitable for egg incubation. Access to extensive river reaches is limited so the assessment will utilize aerial video and photography to cover the mainstem of the Sacramento and McCloud rivers and selected tributary reaches. The aerial information will be augmented with ground-truthed data collected at representative accessible sites.

A reconnaissance trip was made to the Pit River tributaries Hat Creek and Fall River. These tributaries are spring fed systems that likely offer cold water and potentially suitable spawning and rearing habitat reaches. The focus of the RPA (and the draft recovery plan) is on the Sacramento and McCloud systems, so the current focus of the evaluation is on these two systems.

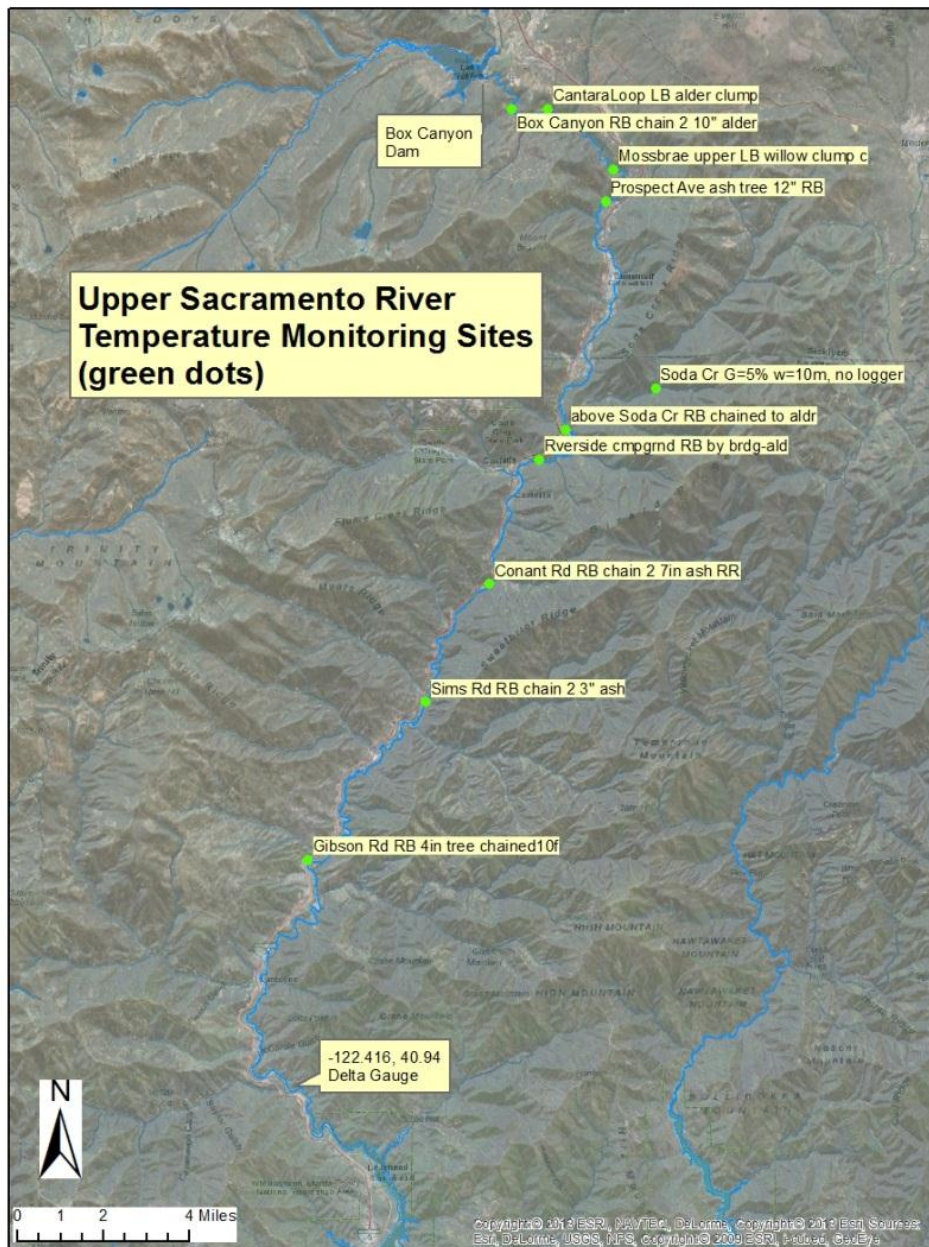


Figure 1. New water temperature logger locations in the Upper Sacramento River

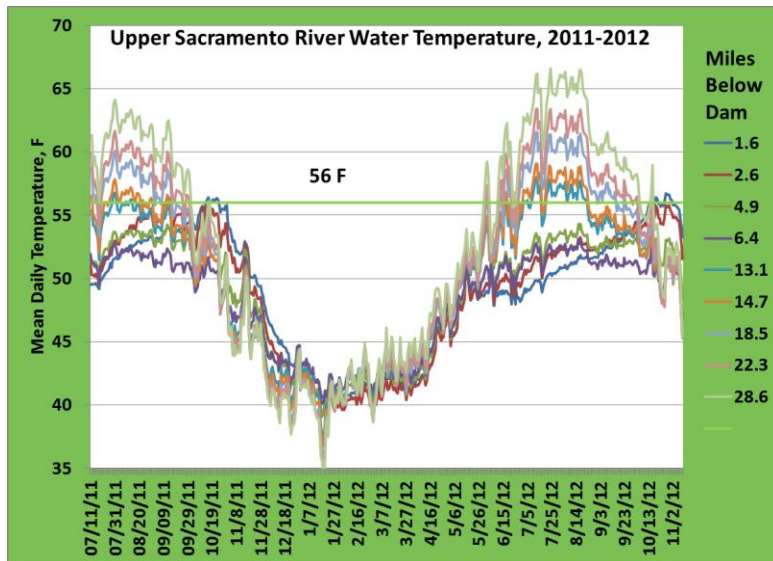


Figure 2. Water temperatures in the Sacramento River upstream of Shasta Reservoir, 2011-2012. Miles below dam are measured from Box Canyon Dam in Mount Shasta. (Source: Reclamation temperature loggers)

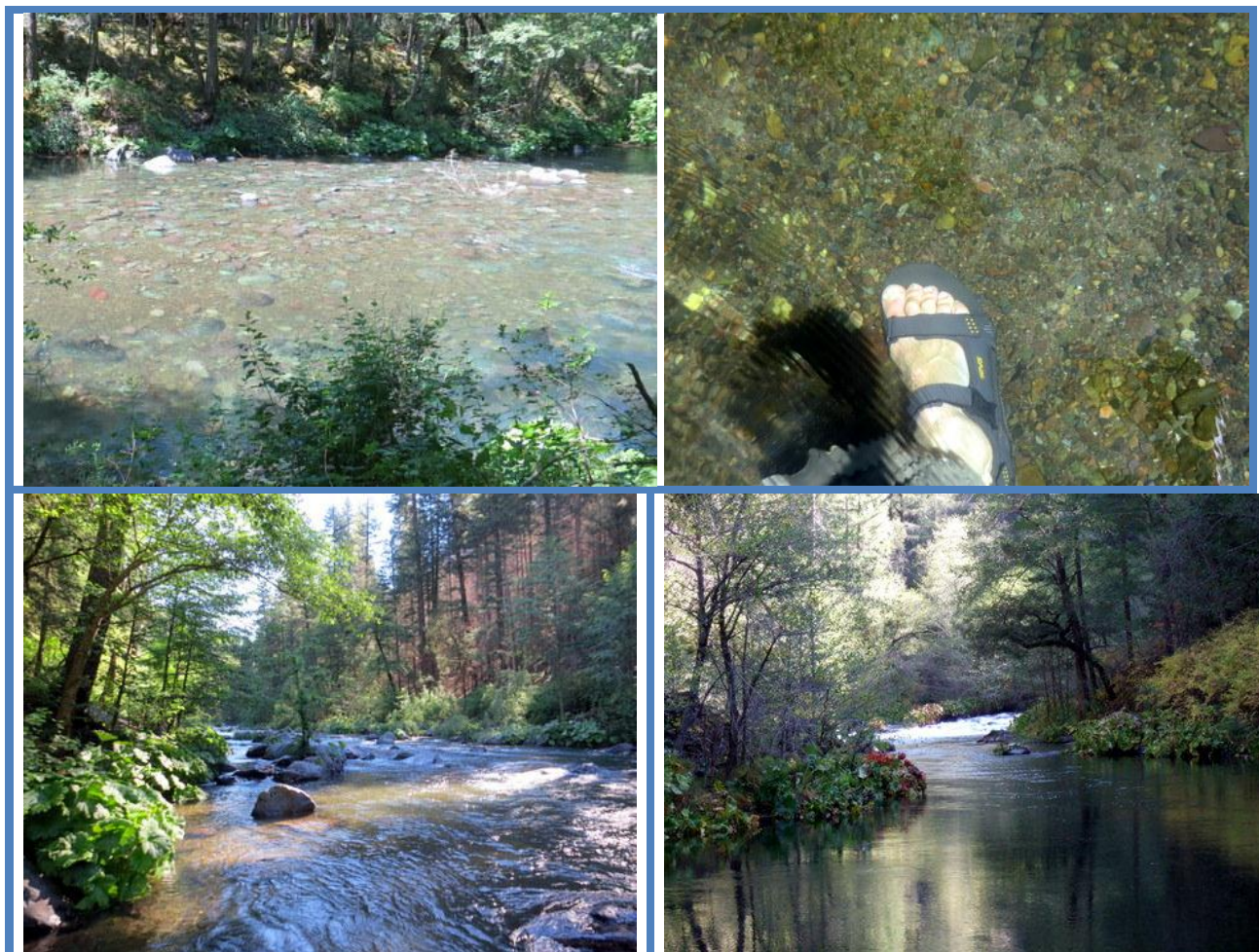


Figure 3. Typical spawning habitats (top) and rearing habitats showing bank vegetation (bottom) in the McCloud River TNC Preserve reach. Burned over area can be seen in the background in the lower left photo. (Source: Reclamation photos)

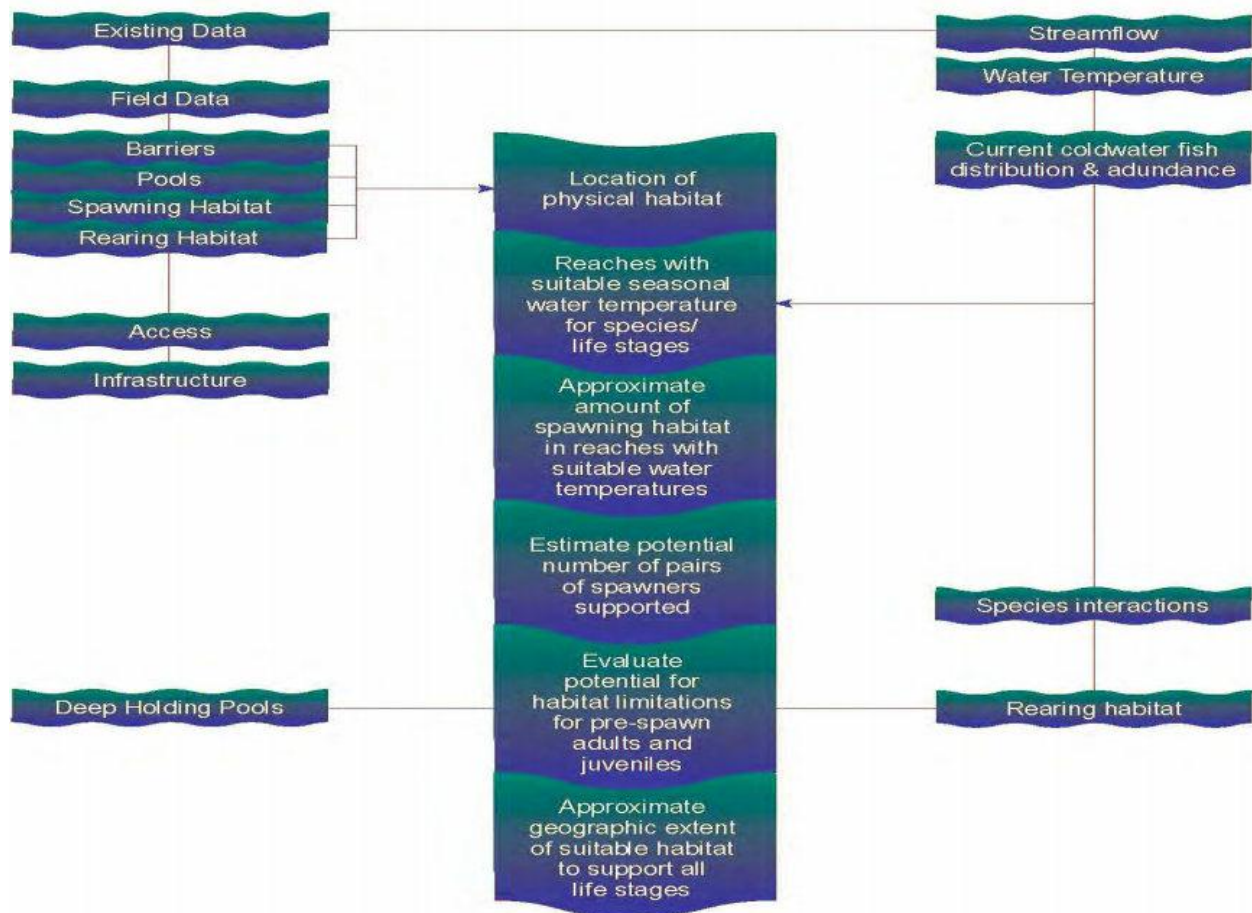


Figure 1. Draft framework for assessment of habitat for Chinook salmon with an approximation of spawner capacity in select tributaries above Shasta Dam.

Technology

The SFPSC Technology Subcommittee is a multi-agency group supporting the SFPSC with members from Reclamation, NMFS, CDFW, and DWR. The purpose of the Subcommittee is to identify potential fish passage methods at a preliminary level and determine which methods are preferred. The Technology Subcommittee will identify precedents where passage over high dams is accomplished in the U.S. and world. The group will examine non-biological implementation issues specific to Shasta Dam (e.g. reservoir complexity/size, storage fluctuation, thermal stratification, temperature control device operations, sport fishery, recreational use, haul distance, access, Keswick Dam operations, potential dam raise), examine impacts to dam operation, and identify risk factors to implementation.

Specific activities accomplished by the Technology Subcommittee include:

- Collected data, maps, and photos on Shasta Dam design and operation and Keswick design and operation
- Collected information on temperature control device design and operation and thermal stratification in the reservoir throughout the year

- Identified precedents for high head fish passage in the U.S. and world
- Investigated surface collector systems for downstream passage of juveniles at other facilities
- Investigated potential for Eicher screens in the penstocks
- Investigated past proposals for fish passage through natural drainages
- Organized site visit to Shasta and Keswick Dam with the following objectives:
 - Visually identify potential locations for at-dam, in-reservoir, head-of-reservoir, and in-tributary collection of downstream juveniles
 - Observe recreation, sport fishery, and infrastructure issues in Shasta Lake
 - Follow downstream drainages from Shasta lake south to determine feasibility of passing juveniles and/or adults through natural drainages
 - Observe Keswick adult fish collection
- Deployed temperature strings in the Sacramento and McCloud Rivers at head-of-reservoir to collect data on thermal stratification at these locations
- Awarded contract for hydrodynamic and thermal CE-QUAL-W2 modeling of head-of-reservoir locations in the Sacramento and McCloud arms, including the modeling of temperature curtains
- Drafted outline for report identifying fish passage options at Shasta Dam
- Interacted with other SFPSC subcommittees and MWH contractor

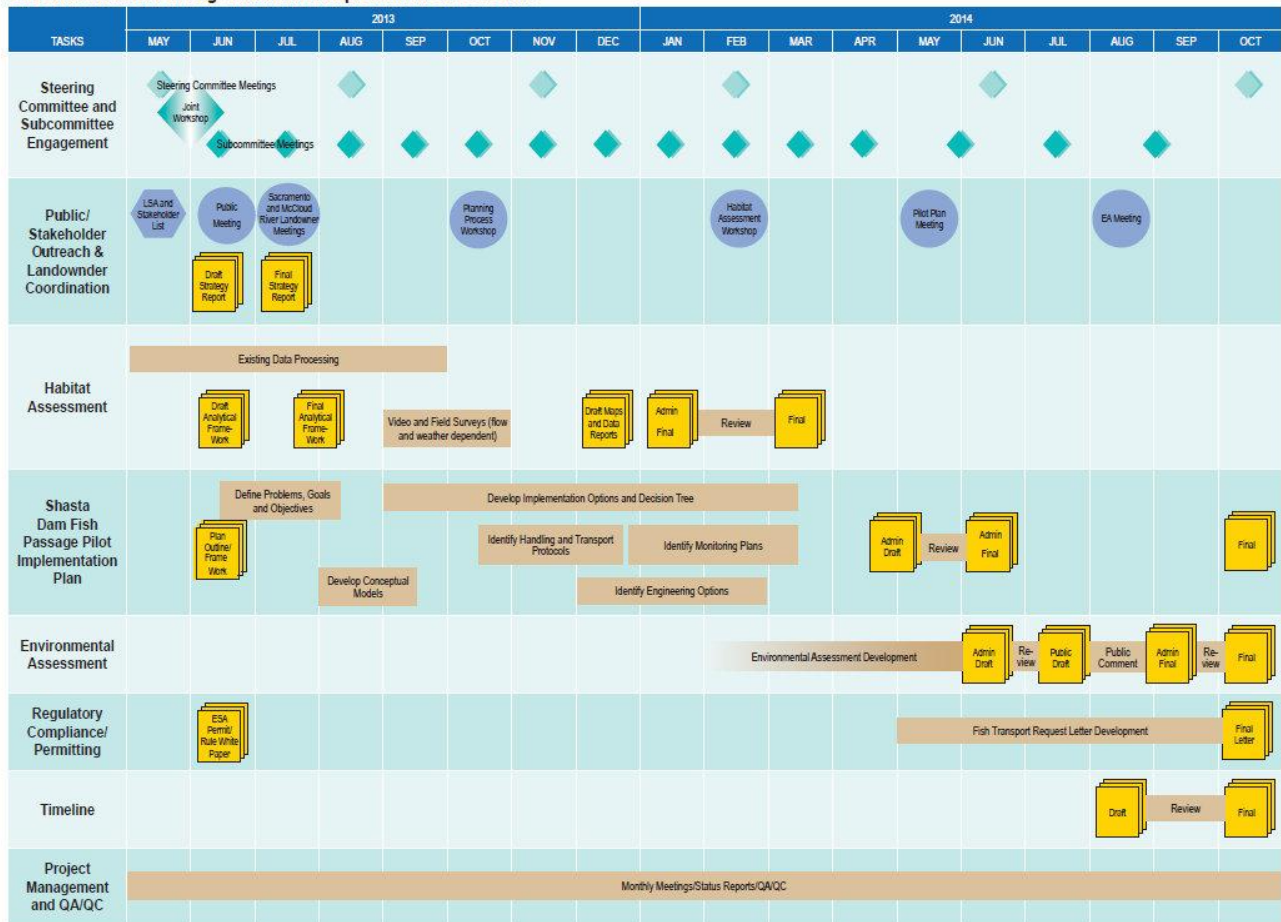
Outreach

Public presentations on the project have been made by Reclamation and NMFS at McCloud River Coordinated Resource Management Plan group regular meetings, the Salmonid Restoration Federation Annual meeting, Siskiyou County Board of Supervisors meetings, and at a Caltrout-sponsored Water Talk in Mount Shasta that focused on informing the public about the project and associated issues. The first publicly advertised workshop sponsored by the project was held in Lakehead in August 2013. The goal of the workshop was to address any key issues and concerns regarding the development of the Shasta Dam Fish Passage Pilot Study and to solicit feedback from landowners and stakeholders regarding any known areas of potentially suitable or significantly unsuitable habitat for Chinook salmon. Presentations focused on providing the background and rationale for the project, reviewing the Federal permitting process, and introducing the Evaluation and the Pilot Implementation Plan as well as the habitat studies. An open house format was used which provided an opportunity after the presentations for the public to look at maps and discuss aspects of the project with the team members in attendance.

Interviews are in process with 20 stakeholders (landowners, public officials, interest groups). The interviewees were preselected by the Outreach Subcommittee to represent the range of interests related to the project. Results of individual interviews will be kept confidential to the MWH team conducting the interviews to ensure unfettered disclosure by stakeholders. The interviews will measure initial awareness of the project, provide insight into the opinions and perceptions of project, and inform development of a communication and engagement plan. A stakeholder database has been assembled and relevant interactions with stakeholders are being documented. The rest of the public outreach process is being developed using feedback received through the

public meeting and interviews. Additional planned outreach activities include watershed specific landowner meetings to discuss landowner issues, a habitat assessment workshop to present results from the habitat study, and a pilot plan meeting to inform the stakeholders about the pilot implementation plan. Figure 5 shows an early schedule of planned activities.

Shasta Dam Fish Passage Evaluation Implementation Schedule



LSA = Landowner and Stakeholder Analysis

Figure 2. Draft schedule for completing the Shasta fish passage pilot plan for initial implementation.

Policy and Regulation

Policy and regulatory related activities have focused on discussions regarding ESA permitting mechanisms that could be used to protect stakeholders upstream of Shasta Dam from regulatory effects of having ESA-listed species introduced into the habitat. There is concern that there could be effects on land use activities such as timber harvest and that fishing regulations may become more restrictive. Although no decisions have been made, winter-run is a preferred species to use in initial pilot studies. MWH is developing a white paper that will lay out various ESA permitting options that can be pursued for utilizing ESA listed fish in pilot studies. Options to be included in the white paper are ESA Section 10(a)1(A) Enhancement of Survival Permit, including the scientific research permit

and Safe Harbor Agreement, and Section 10(j) Experimental Population. The white paper will also describe processes that have been involved in the Deschutes and San Joaquin rivers.

Fish Health and Genetics

Discussions have focused on identifying the disease issues related to transporting Chinook salmon upstream of Shasta. Initial discussions indicated that a disease study needed to be considered prior to moving fish above the dam. Winter-run Chinook salmon adults used at Livingston Stone National Fish Hatchery are screened for diseases each year. It would be informative to know something about the primary diseases of concern that affect fish survival especially in marginal environments. These would include common pathogen loads for columnaris, Ichthyophthirious, infectious hematopoietic necrosis virus (IHNV), bacterial kidney disease, *Ceratomyxa shasta*. Survival or death of adults after relocation may relate to pathogen loads prior to relocation and help guide future efforts. It is probably not crucial to have these analyses done. IHNV is prevalent in all Central Valley Chinook salmon runs and there is concern that releasing adults upstream of Livingston Stone National Fish Hatchery could result in infection of fish reared at the hatchery. Transmission of virus and infection of fish has unpredictable mortality rates in hatchery settings. Loss of 100% of fish has occurred, but much lower losses are more common. Mortality and sickness in wild fish is very difficult to document, but large scale epizootics in wild ecosystems are rare. No decisions have been made regarding any disease study or precautions to be taken to avoid disease transmission.

No decisions have been made regarding what source of fish should be used for the initial pilot studies. The Shasta Fish Passage Pilot Plan requirements are stated in RPA Action NF4 and require a pilot program to be developed for reintroduction of listed winter-run, spring-run and steelhead to habitat above Shasta Dam. The purpose of the pilot project is to determine the feasibility of passage and while winter-run would likely be the best species for feasibility studies, there are many aspects under consideration by the SFPSC and technical subcommittees with regard to the selection of a pilot species including genetics, disease concerns and a life history strategy that most closely approximates the target species. The final decision regarding the race(s) of salmon and the life stage(s) introduced will be determined after the pilot project has been identified.

Pilot Plan

Early drafts of a Pilot Plan were provided to MWH to be used as a starting point. The Pilot Plan will take into account what is learned during outreach activities and habitat assessments. It will identify the Chinook salmon run to be used in the pilot, the potential source of the fish, monitoring activities, potential facilities, and potential hurdles to implementing the pilot study. The specifics of how to implement RPA Action NF4, including adult and juvenile collection, handling, transportation, and release will be covered in the Pilot Plan. A completed Plan permitted for implementation is targeted for 2015.